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WHAT IS CLAIMED IS:

1           1. A semiconductor light emitting device  
2 comprising a single-crystal silicon substrate, an  
3 insulating layer formed on the single-crystal silicon  
4 substrate, and gallium nitride type compound semiconductor  
5 layers stacked on the insulating layer.

1           2. The semiconductor light emitting device of  
2 Claim 1, wherein the single-crystal silicon substrate has  
3 a (111) crystal plane as a principal plane.

1           3. The semiconductor light emitting device of  
2 Claim 1, wherein the insulating layer is made of at least  
3 one of silicon nitride and aluminum oxide.

1           4. The semiconductor light emitting device of  
2 Claim 1, wherein the gallium nitride type compound  
3 semiconductor layers are a plurality of layers including a  
4 p-type layer and an n-type layer and having an active  
5 layer for emission of light.

1           5. The semiconductor light emitting device of  
2 Claim 4, wherein the gallium nitride compound  
3 semiconductor layers comprises a buffer layer, a lower  
4 cladding layer, an active layer, an upper cladding layer,  
5 and a cap layer.

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1           6. The semiconductor light emitting device of  
2 Claim 5, wherein the buffer layer is made of n-type GaN,  
3 the lower cladding layer is made of n-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$   
4 ( $0 < x < 1$ ), the active layer is made of  $\text{Ga}_n\text{In}_{1-n}\text{N}$  ( $0 < n \leq 1$ ),  
5 the upper cladding layer is made of p-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$   
6 ( $0 < x < 1$ ), and the cap layer is made of p-type GaN.

1           7. A method for producing a semiconductor light  
2 emitting device comprising the steps of:

3           (a) forming an insulating layer on a single-  
4 crystal silicon substrate;

5           (b) forming a gallium nitride type compound  
6 semiconductor layer as a buffer layer on the insulating  
7 layer;

8           (c) stacking on the buffer layer in sequence a  
9 lower cladding layer, an active layer, an upper cladding  
10 layer, and a cap layer, these layers being made of the  
11 gallium nitride type compound semiconductor;

12           (d) exposing a predetermined surface of the  
13 buffer layer by etching perpendicularly to the single-  
14 crystal silicon substrate;

15           (e) forming electrodes on both the cap layer and  
16 the predetermined surface of the buffer layer exposed by  
17 the etching treatment in step (d), whereby obtaining a  
18 semiconductor wafer having multilayer structure; and

19           (f) separating the semiconductor wafer to chips  
20 by dicing or by cleaving.

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1           8. The method for producing the semiconductor  
2 light emitting device of Claim 7, wherein the single-  
3 crystal silicon substrate has a (111) crystal plane as a  
4 principal plane.

1           9. The method for producing the semiconductor  
2 light emitting device of Claim 7, wherein the step of  
3 forming the insulating layer is implemented by removing an  
4 oxide film over the single-crystal silicon substrate and  
5 forming a silicon nitride layer by heating under an  
6 atmosphere of nitrogen gas.

1           10. The method for producing the semiconductor  
2 light emitting device of Claim 7, wherein the step of  
3 forming the insulating layer is implemented by growing a  
4 layer of aluminum oxide.

1           11. A semiconductor light emitting device  
2 comprising gallium nitride type compound semiconductor  
3 layers stacked on a gallium nitride type compound  
4 semiconductor substrate.

1           12. A method for producing a semiconductor light  
2 emitting device comprising the steps of:

3           (g) growing a gallium nitride type compound  
4 semiconductor layer on a single-crystal semiconductor  
5 substrate;

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6 (h) removing the single-crystal semiconductor  
7 substrate; and

8 (i) growing single-crystal gallium nitride type  
9 compound semiconductor layers including at least both an  
10 n-type layer and a p-type layer, on the single-crystal  
11 gallium nitride type compound semiconductor layer, with  
12 utilizing the gallium nitride type compound semiconductor  
13 layer as a new substrate.

1 13. The method for producing the semiconductor  
2 light emitting device of Claim 12, wherein the single-  
3 crystal semiconductor substrate is made of at least one  
4 member of selected from the group consisting of gallium  
5 arsenide, gallium phosphide, indium phosphide, and  
6 silicon, and has a (111) crystal plane.

1 14. The method for producing the semiconductor  
2 light emitting device of Claim 12, wherein the step (g) of  
3 growing the gallium nitride type compound semiconductor  
4 layer on the single-crystal semiconductor substrate is  
5 implemented by forming a low-temperature buffer layer of  
6 the gallium nitride type compound semiconductor on the  
7 single-crystal semiconductor substrate at low temperature  
8 of 400°C to 700°C and growing the gallium nitride type  
9 compound semiconductor layer at higher temperature of  
10 700°C to 1200°C.

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1           15. The method for producing the semiconductor  
2 light emitting device of Claim 12, wherein before the step  
3 (i) of growing the single-crystal gallium nitride type  
4 compound semiconductor layers, a low-temperature buffer  
5 layer of a gallium nitride type compound semiconductor is  
6 grown at low temperature of 400°C to 700°C and then, a  
7 high-temperature buffer layer of the gallium nitride type  
8 compound semiconductor is grown at high temperature of  
9 700°C to 1200°C and is followed by the growing of the  
10 single-crystal gallium nitride type compound semiconductor  
11 layers.

1           16. The method for producing the semiconductor  
2 light emitting device of Claim 15, wherein the  
3 single-crystal gallium nitride type compound semiconductor  
4 layers including at least both an n-type layer and a  
5 p-type layer comprise an n-type cladding layer, an active  
6 layer, and a p-type cladding layer, these layers forming a  
7 sandwich structure, the band gap energy of the active  
8 layer being smaller than that of the n-type cladding layer  
9 or p-type cladding layer, and the n-type cladding layer,  
10 p-type cladding layer and high-temperature buffer layer  
11 and the gallium nitride type compound semiconductor  
12 substrate being the same in chemical composition.

1           17. The method for producing the semiconductor  
2 light emitting device of Claim 12, wherein a semiconductor

3 wafer on which the single-crystal gallium nitride type  
4 compound semiconductor layers are formed is cleft to  
5 chips.

1 18. A semiconductor light emitting device  
2 comprising gallium nitride type compound semiconductor  
3 layers stacked on a group II-VI compound semiconductor  
4 substrate.

1                    19. The semiconductor light emitting device of  
2 Claim 18, wherein the gallium nitride type compound  
3 semiconductor layers are stacked on the substrate having a  
4 principal plane, the principal plane being a top surface  
5 comprising group VI atoms of the group II-VI compound  
6 semiconductor substrate.

1                    20. The semiconductor light emitting device of  
2 Claim 18, wherein the semiconductor substrate of the group  
3 II-VI compound material is made of at least one of zinc  
4 selenide and zinc sulfide.

1           21. The semiconductor light emitting device of  
2 Claim 18, wherein the gallium nitride type compound  
3 semiconductor layers are a plurality of layers including a  
4 p-type layer and an n-type layer and having an active  
5 layer for emission of light.

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1           22. The semiconductor light emitting device of  
2 Claim 18, wherein the gallium nitride type compound  
3 semiconductor layers comprises a buffer layer, a lower  
4 cladding layer, an active layer, an upper cladding layer,  
5 and a cap layer.

1           23. The semiconductor light emitting device of  
2 Claim 22, wherein the buffer layer is made of n-type GaN,  
3 the lower cladding layer is made of n-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$   
4 ( $0 < x < 1$ ), the active layer is made of  $\text{Ga}_n\text{In}_{1-n}\text{N}$  ( $0 < n \leq 1$ ),  
5 the upper cladding layer is made of p-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$   
6 ( $0 < x < 1$ ), and the cap layer is made of p-type GaN.

1           24. A method for producing a semiconductor light  
2 emitting device comprising the steps of:

3           (j) preparing a group II-VI compound  
4 semiconductor substrate;

5           (k) stacking a buffer layer of gallium nitride  
6 type compound semiconductor on a principal plane of the  
7 group II-VI compound semiconductor substrate;

8           (l) stacking on the buffer layer in sequence a  
9 lower cladding layer, an active layer, an upper cladding  
10 layer, and a cap layer, these layers being made of gallium  
11 nitride semiconductor, with matching crystal lattice of  
12 each layer to one another;

13           (m) forming electrodes on both the top of the cap  
14 layer and the bottom of the group II-VI compound

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15 semiconductor substrate, whereby obtaining a semiconductor  
16 wafer having multilayer structure; and  
17 (n) cleaving the semiconductor wafer to chips.

1 25. The method for producing a semiconductor  
2 light emitting device of Claim 24, wherein the step of  
3 stacking the buffer layer is implemented by forming a low-  
4 temperature buffer layer at low temperature and then, by  
5 forming a high-temperature buffer layer at high  
6 temperature.

1 26. The method for producing a semiconductor  
2 light emitting device of Claim 24, wherein the buffer  
3 layers are made of n-type GaN, the lower cladding layer is  
4 made of n-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 < x < 1$ ), the active layer is made  
5 of  $\text{Ga}_n\text{In}_{1-n}\text{N}$  ( $0 < n \leq 1$ ), the upper cladding layer is made of  
6 p-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 < x < 1$ ), and the cap layer is made of  
7 p-type GaN.

1 27. The method for producing a semiconductor  
2 light emitting device of Claim 24, wherein the group II-VI  
3 compound semiconductor substrate having a principal plane,  
4 the principal plane being a top surface comprising group  
5 VI atoms of the group III-V compound semiconductor  
6 substrate, is prepared.

1 28. A semiconductor light emitting device



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2 comprising gallium nitride type compound semiconductor  
3 layers stacked on a group III-V compound semiconductor  
4 substrate.

1           29. The semiconductor light emitting device of  
2 Claim 28, wherein the gallium nitride type compound  
3 semiconductor layers are stacked on the group III-V  
4 compound semiconductor substrate having a principal plane,  
5 the principal plane being a top surface comprising group V  
6 atoms of the group III-V compound semiconductor substrate,  
7 is prepared.

1           30. The semiconductor light emitting device of  
2 Claim 28, wherein the group III-V compound semiconductor  
3 substrate is made of a member selected from the group  
4 consisting of gallium arsenide, indium arsenide, gallium  
5 phosphide and indium phosphide.

1           31. The semiconductor light emitting device of  
2 Claim 28, wherein the gallium nitride type compound  
3 semiconductor layers are a plurality of layers including a  
4 p-type layer and an n-type layer and having an active  
5 layer for emission of light.

1           32. The semiconductor light emitting device of  
2 Claim 28, wherein the gallium nitride type compound  
3 semiconductor layers comprises a buffer layer, a lower

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4 cladding layer, an active layer, an upper cladding layer,  
5 and a cap layer.

1           33. The semiconductor light emitting device of  
2 Claim 32, wherein the buffer layer is made of n-type  
3  $\text{Ga}_w\text{In}_{1-w}\text{N}$  ( $0 < w \leq 1$ ), the lower cladding layer is made of  
4 n-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 \leq x < 1$ ), the active layer is made of  
5  $\text{Ga}_n\text{In}_{1-n}\text{N}$  ( $0 < n \leq 1$ ), the upper cladding layer is made of  
6 p-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 < x < 1$ ), and the cap layer is made of  
7 p-type GaN.

1           34. A method for producing a semiconductor light  
2 emitting device comprising the steps of:

3           (o) preparing a group III-V compound  
4 semiconductor substrate;

5           (p) stacking a buffer layer of gallium nitride  
6 type compound semiconductor on a principal plane of the  
7 group III-V compound semiconductor substrate;

8           (q) stacking on the buffer layers in sequence a  
9 lower cladding layer, an active layer, an upper cladding  
10 layer, and a cap layer, these layers being made of gallium  
11 nitride type semiconductor, with matching crystal lattice  
12 of each layer to one another;

13           (r) forming electrodes on both the top of the cap  
14 layer and the bottom of the group III-V compound  
15 semiconductor substrate, whereby obtaining a semiconductor  
16 wafer having multilayer structure; and

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17 (s) cleaving the semiconductor wafer to chips.

1 35. The method for producing semiconductor light  
2 emitting device of Claim 34, wherein the step of forming  
3 the buffer layers is implemented by forming a low-  
4 temperature buffer layer at low temperature and then, by  
5 forming a high-temperature buffer layer at high  
6 temperature.

1 36. The method for producing the semiconductor  
2 light emitting device of Claim 34, wherein the buffer  
3 layers are made of n-type  $\text{Ga}_w\text{In}_{1-w}\text{N}$  ( $0 < w \leq 1$ ), the lower  
4 cladding layer is made of n-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 \leq x < 1$ ), the  
5 active layer is made of  $\text{Ga}_n\text{In}_{1-n}\text{N}$  ( $0 < n \leq 1$ ), the upper  
6 cladding layer is made of p-type  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 \leq x < 1$ ), and  
7 the cap layer is made of p-type GaN.

1 37. The method for producing the semiconductor  
2 light emitting device of Claim 34, wherein the group III-V  
3 compound semiconductor substrate having a principal plane,  
4 the principal plane being a top surface comprising group V  
5 atoms of the group III-V compound semiconductor substrate,  
6 is prepared.